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JOSHUA D. ISENBERG			HALL, ASHA J	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/771,092	ROSCHEISEN ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Asha Hall	1709	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 02 February 2004.  
 2a) This action is FINAL.                  2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1-45 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1-45 is/are rejected.  
 7) Claim(s) 15 is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | Paper No(s)/Mail Date: _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>February 2, 2004</u> . | 5) <input type="checkbox"/> Notice of Informal Patent Application |
|   | 6) <input type="checkbox"/> Other: _____                          |

**DETAILED ACTION**

***Double Patenting***

1. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

2. Claims 1,3,4,9,11-13,16-26,28,30,32,33,35,39, & 40 provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-8,10-14,19,21,22,24,27-42,44,47,49,51,53,55,56,58-60, & 62 of copending Application No. 10/771,250. Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims of the reference application are substantially the same or encompass all of the limitations of the instant application.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

#### ***Claim Objections***

3. Claim 15 is objected to under 37 CFR 1.75(c) as being in improper form because a claim cannot depend upon itself. For examination purposes, claim 15 has been treated as if it depends on 14. Appropriate correction is required.

#### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Den et al. (EP 1,087,446) in view of Nakamura (6,291,763).

With respect to claim 1, Den et al. discloses a photovoltaic conversion device as shown in Figure 1d, comprising of (col.9; lines:15-25):

- (a) nano-structured template/semiconductor acicular crystals (17) (col.10; lines: 22-25) made from a n-type charge transfer-material electron donor charge transfer layer (17) (col.7; lines:49-52),
- (b) the nano-structured template/ semiconductor acicular crystals (17) (col.10; lines: 22-25) having template elements preferably less than 100 nm in diameter (col.5; lines: 6-10),
- (c) another charge-transfer material (12) conformally coating one or more walls of the template elements leaving additional space (col.7; lines: 49-52),
- (d) wherein the charge-transfer material (17) is n-type and the second/other charge-transfer is p-type (12) (col.9; lines:15-25);
- (e) a third material/light absorption layer (16) in the additional space, wherein the third material is a p-type or conducting material that volumetrically interdigitates with the second/other charge-transfer material (12) (Figure 4A),
- (f) wherein a lowest unoccupied molecular orbital (LUMO) (col. 13; lines: 38-50) or conduction band of the first charge-transfer material (Si) (col.1; lines: 18-24) differs from a LUMO or conduction band of the second charge-transfer material by less than about 1eV (for Si the band gap energy is ~ 1eV)

Den et al. fails to disclose a template/acyclic crystal element density of between about  $10^{12}$  elements/m<sup>2</sup> to  $10^{16}$  elements/m<sup>2</sup>. Nakamura discloses a photoelectric conversion device with electrically insulating particles/templates (col.1; lines: 52-54) (Figure 1d), and further discloses a template element with a carrier concentration of  $10^{14}$ - $10^{20}$  elements/cm<sup>3</sup> (col. 4; lines: 29-35). Nakamura teaches that the tasks of light absorption and generation of excited electrons and positive holes are chiefly performed by the elements (col. 4; lines: 35-40). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the density range of template elements of Nakamura et al. to the photoelectric conversion device of Den et al. in order to obtain sufficient light absorption and generate excited electrons and holes for photoelectric conversion to occur.

Den et al. fails to disclose wherein a light/wavelength absorbance of least one charge transfer material/electrically conductive substrate is greater than about  $10^3$ /cm at the peak of the absorption spectrum. Nakamura et al. a photoelectric conversion device with electrically insulating particles/templates (col.1; lines: 52-54) (Figure 1d), and further discloses wherein a light/wavelength absorbance of least one charge transfer material/electrically conductive substrate is greater than about  $10^3$ /cm (visible wavelengths range: 400-900 or  $1.43\text{-}2.95 \times 10^4$ /cm) at the peak of the absorption spectrum which has light transmission from 50-70% with the charge transfer material/electrically conductive material (col.5; lines:52-59). It would have been obvious to one of ordinary skill in the art at the time of the invention to utilize a charge

transfer/electrically conductive material of Nakamura et al. to the photovoltaic device of Den et al. in order to achieve 50-70% light transmission.

With respect to claim 2, Den et al. discloses a photovoltaic conversion device (Figure 1d) of claim 1 above, and further discloses the third charge-transfer material/absorption layer (16) in the form of one or more elongated structures that volumetrically interdigitate with the second/other charge transfer material (12)(Figure 1d).

With respect to claim 3, Den et al. discloses the photoelectric conversion device of claim 2 above, and further discloses in Figure 9B a base electrode (66) and a top electrode (65), wherein the nano-structured template/particles (17) is disposed between the base electrode (66) and top electrode (65).

In regard to claim 4, Den et al. discloses the photoelectric conversion device of claim 3 above, and further discloses in Figure 9B the first charge-transfer material (63) is in electrical contact with the base electrode (66) and the third charge-transfer material/light absorption layer (16) is in contact with the top electrode (65).

In regard to claim 5, Den et al. discloses the photoelectric conversion device of claim 3 above, and further one or more plugs/circular materials of at the tips of the elongated structures (Figure 10) to create grain boundaries that protect against undesired electrical contact between the third charge-transfer material and the template and/or base electrode (col.9; lines: 3-7).

With respect to claim 6, Den et al. discloses the device of claim 3 above, and further discloses the third charge-transfer material/light absorption layer (16) is a

transparent (absorbs light) conductive (transfers charges) material (col. 7; lines: 49-52 & col.8; lines: 58-col.9; lines: 1-2).

In regard to claim 7, Den et al. discloses the device of claim 3 above, and further discloses wherein the third charge-transfer material includes an organic semiconducting material/ion conductive polymer (col.14; lines: 12-20).

With respect to claim 8, Den et al. discloses the device of claim 7 above, and further discloses wherein the third charge transfer material/light absorption layer (16) has a different light absorption range and/or a different HOMO/LUMO level than the second charge transfer material (col.13; lines: 38-54).

In regard to claim 9, Den et al. discloses the device of claim 2 above, and further discloses in Figure 9B wherein one or more of the base electrode (66) and top (65) is a transparent electrode (col. 14; lines: 44-46).

With respect to claim 10, Den et al. discloses the photoelectric conversion device of claim 1 above, and further disclose the first charge-transfer material as an inorganic material (col.14; lines: 20-23) and the second and third charge-transfer materials are organic/polymeric materials (col.14; lines: 26-29).

With respect to claim 11, Den et al. discloses the photoelectric conversion device of claim 1 above, and further discloses the first charge-transfer material as an electrically semiconductive or conductive material (col.9; lines: 15-25).

In regard to claim 12, Den et al. discloses the photoelectric conversion device of claim 1 above, and further discloses the second charge transfer material (12) coats the

template elements/acyclic crystal (17) up to a level that is substantially even with an upper surface of the template (Figure 1d).

With respect to claim 13, Den et al. discloses the photoelectric conversion device of claim 1 above, and further discloses the first, second, or third charge-transfer material includes one or more materials from the group of titanium oxide, zinc oxide, tin oxide (col.11; lines: 11-17).

In regard to claims 14 and 15, Den et al. discloses the photoelectric conversion device of claim 1 above, and further disclose wherein the first charge-transfer material (17) includes a transparent (absorbs light) conductive oxide such as titanium oxide or zinc oxide (col. 11; lines: 11-17).

With respect to claim 16, Den et al. discloses the photoelectric conversion device of claim 15, and further discloses wherein the second charge-transfer material (12) is a p-type semiconducting material (col.11; lines: 15-17).

With respect to claim 17, Den et al. discloses the photoelectric conversion device of claim 1, and further discloses an interfacial layer /light absorption layer made of transparent conductive polymer disposed between the first and second charge-transfer materials (col.7; lines: 49-51).

In regard to claim 18, Den et al. discloses the photoelectric conversion device of claim 17 above, and further discloses the interfacial layer/light absorption layer includes one or more materials chosen from C<sub>60</sub>/COOH (col.13; lines: 12-27).

In regard to claim 19, Den et al. discloses the photoelectric conversion device of claim 17 above, and further discloses the interfacial layer/ light absorption layer as

including one or more chemicals (col.13; lines: 26-29) that can covalently attach to the charge-transfer material (col.13; lines: 23-37) and change a surface energy/ or bonding trap-states by attaching dangling-bonds thus allowing the charge transfer layer to enter among the acicular crystals (col. 14; lines: 24-29) at an exposed surface of the charge-transfer material that may increase the efficiency for charge extraction thereby reducing detrimental charge recombination (col.13; lines: 38-53).

With respect to claim 20, Den et al. discloses the device of claim 17 above, and further discloses wherein the interfacial layer includes a carboxylic acid moiety/COOH (col.13; lines: 26-36).

In regard to claim 21, Den et al. discloses the photoelectric conversion device of claim 1 above, and further discloses wherein the second charge-transfer material includes two or more complementary charge-transfer materials that are blended together (simple solution with a carrier produced by a carbon powder) (col.14; lines: 14-20).

With respect to claims 22 and 23, Den et al. discloses the photoelectric conversion device of claim 1 above, and further discloses wherein the one or more of the second or third charge-transfer materials are organic materials (col.14; lines: 12-20); which includes a material chosen from the group of organometallic polymers/ion conductive polymer or organic polymer (col.14; lines: 14-23).

With respect to claim 24, Den et al. discloses the photoelectric conversion device of claim 1 above, and further discloses wherein one or more of the second and

third charge-transfer material is a dye (col13; lines: 38-45) linking to the cyano groups (col.13; lines: 26-27).

In regard to claim 25, Den et al. discloses the photoelectric conversion device of claim 1 above, and further discloses wherein one or more of the second or third charge-transfer materials includes one or more materials chosen from the group of conjugated polymers (col.14; lines: 14-23) and mixture of these materials.

With respect to claim 26, Den et al. discloses the photoelectric conversion device of claim 1 above, and discloses wherein the template elements are in the form tubes that protrude from the template with spaces between the sidewalls of the tubes (Figure 4).

In regard to claim 27, Den et al. discloses the photoelectric conversion device of claim 1 above, and fails to disclose wherein the third charge transfer material includes one or more transparent conducting materials.

Nakamura discloses a photoelectric conversion device comprised of charge transfer materials (col. 3; lines: 64-67 & col.4; lines: 1-5) and further discloses charge transfer material including one or more transparent conducting materials/conductive transparent polymer film to manufacture flexible photoelectric conversion devices (col. 6; lines: 8-17). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate transparent conducting materials of Nakamura to the charge transfer materials of Den et al. in order to manufacture a flexible photoelectric conversion device.

In regard to claim 28, Nakamura further discloses that one or more transparent conducting materials include N,N-di-p-methoxyphenyl-amine to transport holes which can be used in place of the electrolyte (col.27; lines: 37-50). With respect to claim 29, Den et al. discloses the photoelectric conversion device of claim 27 above, and fails to disclose the one or more transparent conducting materials/light absorption layer (16) conformally coat and interdigitate into the second charge transfer material (12) (Figure 1d).

With respect to claim 29, Den et al. discloses the photoelectric conversion device of claim 27 above, further discloses one or more transparent conducting materials/light absorption layer (16) conformal coating and interdigitate in to the second charge transfer material (12) as shown in Figure 1d.

In regard to claims 30 and 31, Den et al. discloses the photoelectric conversion device of claim 1 above, and further discloses the semiconductor acicular crystal is consider as a charge transfer layer (col.7; lines: 49-52) and the acicular crystal grows from the charge transfer layer (col.11; lines: 54-58) and (col.14; lines: 4-12), thus the charge transfer layer of material one is the same as the other charge transfer layer. Den et al. further discloses that they are made of inorganic material (col.14; lines: 20-23).

With respect to claim 32, Den et al. discloses a photovoltaic device as shown in Figure 9B with a top electrode (65) and a base electrode (66); a nano-structured template disposed between the base electrode (66) and top electrode (65) wherein the nano-structured template nano-structured template/semiconductor acicular crystals (17) (col.10; lines: 22-25) made from a n-type charge transfer-material

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electron donor charge transfer layer (17) (col.7; lines:49-52), the nano-structured template/ semiconductor acicular crystal bearing particles (17) (col.10; lines: 22-25) having template elements preferably less than 100 nm in diameter (col.10; lines: 56-58). Den et al. further discloses that another charge-transfer material (12) conformally coating one or more walls of the template elements leaving additional space (col.7; lines: 49-52), and another material/light absorption layer (16) is in the additional space, wherein the other material is a p-type or conducting material that volumetrically interdigitates with the charge-transfer material (17) (Figure 4A).

Den et al. fails to disclose a template/acicular crystal element density of between about  $10^{12}$  elements/m<sup>2</sup> to  $10^{16}$  elements/m<sup>2</sup>. Nakamura discloses a photoelectric conversion device with electrically insulating particles/templates (col.1; lines: 52-54) (Figure 1d) and further discloses a template/carrier concentration of  $10^{14}$ - $10^{20}$  elements/cm<sup>3</sup> (col. 4; lines: 29-35). Nakamura teaches that the tasks of light absorption and generation of excited electrons and positive holes are chiefly performed by the elements (col. 4; lines: 35-40). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporated the density of elements of Nakamura et al. to the photoelectric conversion device of Den et al. in order to obtain sufficient light absorption and generate excited electrons and holes for photoelectric conversion to occur.

With respect to claim 33, Den et al. discloses a method for making a photovoltaic device, comprising the steps of: forming a nanostructured template from a first charge-transfer material such that the semiconductor acicular crystal is consider as a charge

transfer layer (col.7; lines: 49-52) and the acicular crystal grows from the charge transfer layer (col.11; lines: 54-58) and (col.14; lines: 4-12), thus the charge transfer layer of material one is the same as the other charge transfer layer.

Den et al. further discloses that another charge-transfer material (12) conformally coating one or more walls of the template elements leaving additional space (col.7; lines: 49-52), and another material/light absorption layer (16) is in the additional space, wherein the second material is a p-type/ which complementary to the first n-type charge transfer conducting material that volumetrically interdigitates with the third charge-transfer material (17) (Figure 4A).

Den et al. fails to disclose a template/acicular crystal element density of between about  $10^{12}$  elements/m<sup>2</sup> and about  $10^{16}$  elements/m<sup>2</sup>. Nakamura discloses a photoelectric conversion device with electrically insulating particles/templates (col.1; lines: 52-54) (Figure 1) and further discloses a template/carrier concentration of  $10^{14}$ - $10^{20}$  elements/cm<sup>3</sup> (col. 4; lines: 29-35). Nakamura teaches that the tasks of light absorption and generation of excited electrons and positive holes are chiefly performed by the dye molecules (col. 4; lines: 35-40). It would have been obvious to one of ordinary skill in the art at the time of the invention to have a density of dye elements/particles of Nakamura et al. to the photoelectric conversion device of Den et al. in order to obtain light absorption and generate excited electrons and holes for photoelectric conversion to occur.

In regard to claim 34, Den et al. discloses the method of claim 33 above, and further discloses the first charge-transfer material such as titanium oxide (col.11; lines: 11-17).

With respect to claim 35, Den et al. discloses the method of claim 33 above, wherein forming a nano-structured template includes anodizing a metal layer (col. 12; lines: 4-10).

In regard to claim 36, Den et al. discloses the method of claim 33 above, and further discloses an interfacial layer /light absorption layer made of transparent conductive polymer disposed/sandwiched between two charge-transfer materials (col.7; lines: 49-51).

With respect to claim 37, Den et al. discloses the method of claim 33 above, and further discloses the third charge-transfer material/absorption layer (16) in the form of one or more elongated structures that volumetrically interdigitate with the second charge transfer material (12)(Figure 1d).

In regard to claim 38, Den et al. discloses the method of claim 37 above, and further discloses capping one or more tips of the elongated structures with a short-proofing/circular material (Figure 10A).

With respect to claim 39, Den et al. discloses the method of claim 33 above, and further discloses that another charge-transfer material (12) conformally coating one or more walls of the nano-structured template elements (col.7; lines: 49-52).

In regard to claim 40, Den et al. discloses the method of claim 39 above, and further discloses depositing the second charge transfer material on the walls of the

nanostructured template including the use of a technique such as chemical vapor deposition (CVD) or physical vapor deposition (PVD) method (col. 11; lines: 56-58 & col.12; lines: 1-3).

With respect to claim 41, Den et al. discloses the method of claim 33 above, and further discloses where filling the additional space with the third charge transfer material (16) includes depositing evaporation/anodizing in nano-pores using acids (col.12; lines: 38-45).

In regard to claim 42, Den et al. discloses the photoelectric conversion device of claim 33 above, and fails to disclose wherein the third charge transfer material includes one or more transparent conducting materials.

Nakamura discloses a photoelectric conversion device comprised of charge transfer materials (col. 3; lines: 64-67 & col.4; lines: 1-5) and further discloses charge transfer material including one or more transparent conducting materials/conductive transparent polymer film to manufacture flexible photoelectric conversion devices (col. 6; lines: 8-17). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate transparent conducting materials of Nakamura to the charge transfer materials of Den et al. in order to manufacture a flexible photoelectric conversion device.

In regard to claim 43, Nakamura further discloses wherein the one or more transparent conducting materials include N,N-di-p-methoxyphenyl-amine to transport holes which can be used in place of the electrolyte (col.27; lines: 37-50).

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With respect to claim 44, Den et al. discloses the photoelectric conversion device of claim 42 above, further discloses one or more transparent conducting materials/light absorption layer (16) conformal coating and interdigitate in to the second charge transfer material (12) as shown in Figure 1d

In regard to claim 45, Nakamura further discloses wherein the one or more transparent conducting materials include N,N-di-p-methoxyphenyl-amine to transport holes which can be used in place of the electrolyte (col.27; lines: 37-50).

***Conclusion***

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Asha Hall whose telephone number is 571-272-9812. The examiner can normally be reached on Monday-Friday 7:30-5:00PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AJH  
*[Signature]*

*Alex Neckel*  
ALEXA D. NECKEL  
SUPERVISORY PATENT EXAMINER